

WHAT IS CLAIMED IS:

1. An image sensor comprising:

a plurality of photoelectric conversion elements arranged in a main scanning direction, each of the plurality  
5 of photoelectric conversion elements generating an analog image signal corresponding to an amount of incident light thereon, the plurality of photoelectric conversion elements being divided into plural groups, each of the plural groups including a predetermined number (N) of the photoelectric  
10 conversion elements;

a plurality of switching elements connected to respective ones of the plurality of photoelectric conversion elements, individually; and

a control unit that controls the plurality of  
15 switching elements in response to an external clock signal to simultaneously output the image signals from the predetermined number of photoelectric conversion elements in one of the plural groups.

2. The image sensor according to claim 1, further  
20 comprising signal output lines with a number equal to N, wherein the predetermined number of photoelectric conversion elements in each of the plural groups are connectable with the respective ones of the signal output lines through the switching elements, individually, to output the image  
25 signals from the predetermined number of photoelectric

conversion elements to the corresponding signal output line.

3. The image sensor according to claim 2, further comprising an amplifier connected to each of the signal output lines, the amplifier amplifying the image signal  
5 received from the respective one of the photoelectric conversion elements through the corresponding one of the switching elements.

4. The image sensor according to claim 3, further comprising a multiplexer provided subsequent to the  
10 amplifier, the multiplexer multiplexing the image signal which is transmitted from each of the photoelectric conversion elements and then amplified by the amplifiers.

5. The image sensor according to claim 2, further comprising a multiplexer connected to each of the signal  
15 output lines, the multiplexer multiplexing the image signal which is transmitted from each of the photoelectric conversion elements.

6. The image sensor according to claim 5, further comprising an amplifier that amplifies the image signal  
20 which is transmitted from one of the photoelectric conversion elements and then multiplexed by the multiplexer.

7. The image sensor according to claim 5, further comprising a sample-and-hold circuit provided prior to the multiplexer that temporarily stores the image signal  
25 received from each of the photoelectric conversion elements.

8. The image sensor according to claim 4, further comprising a sample-and-hold circuit provided prior to the multiplexer that temporarily stores the image signal transmitted from one of the photoelectric conversion elements.

9. An image reading apparatus comprising:  
an image sensor that includes:

a plurality of photoelectric conversion elements arranged in a main scanning direction, each of the plurality of photoelectric conversion elements generating an analog image signal corresponding to an amount of incident light thereon, the plurality of photoelectric conversion elements being divided into plural groups, each of the plural groups including a predetermined number (N) of the photoelectric conversion elements,

a plurality of switching elements connected to respective ones of the plurality of photoelectric conversion elements, individually,

a control unit that controls the plurality of switching elements in response to an external clock signal to simultaneously output the image signals from the predetermined number of photoelectric conversion elements in one of the plural groups, and

signal output lines with a number equal to N,  
wherein the predetermined number of photoelectric conversion

elements in each of the plural groups are connectable with  
th respective ones of the signal output lines through the  
switching elements, individually, to output the image  
signals from the predetermined number of photoelectric  
5 conversion elements to the signal output lines;

a multiplexer connected to the signal output lines of  
the image sensor for multiplexing the image signals  
transferred through the signal output lines; and

an analog-to-digital converter for converting the  
10 image signal that is multiplexed by the multiplexer into a  
digital signal.

10. The image reading apparatus according to claim 9,  
further comprising a plurality of analog amplifiers  
connected with the respective ones of the signal output  
15 lines, individually, for amplifying the image signal  
received from each of the photoelectric conversion elements  
through the corresponding switching elements.

11. An image reading apparatus comprising:

an image sensor that includes:

20 a plurality of photoelectric conversion elements  
arranged in a main scanning direction, each of the plurality  
of photoelectric conversion elements generating an analog  
image signal corresponding to an amount of incident light  
thereon, the plurality of photoelectric conversion elements  
25 being divided into plural groups, each of the plural groups

including a predetermined number (N) of the photoelectric conversion elements;

5 a plurality of switching elements connected to respective ones of the plurality of photoelectric conversion elements, individually;

a control unit that controls the plurality of switching elements in response to an external clock signal to simultaneously output the image signals from the predetermined number of photoelectric conversion elements in  
10 one of the plural groups; and

signal output lines with a number equal to N, wherein the predetermined number of photoelectric conversion elements in each of the plural groups are connectable with the respective ones of the signal output lines through the  
15 switching elements, individually, to output the image signals from the predetermined number of photoelectric conversion elements to the signal output lines; and

a plurality of analog-to-digital converters connected to the respective ones of the signal output lines,  
20 individually, for converting the image signals transferred through the signal output lines into digital signals.

12. The image reading apparatus according to claim 11, wherein each of the signal output lines is provided with an analog amplifier for amplifying the image signal  
25 transferred from the corresponding one of the photoelectric

conversion elements through the corresponding one of the switching elements.

13. An image reading apparatus comprising:

an image sensor that includes:

5           a plurality of photoelectric conversion elements arranged in a main scanning direction, each of the plurality of photoelectric conversion elements generating an analog image signal corresponding to an amount of incident light thereon, the plurality of photoelectric conversion elements  
10       being divided into plural groups, each of the plural groups including a predetermined number (N) of the photoelectric conversion elements;

          a plurality of switching elements connected to respective ones of the plurality of photoelectric conversion  
15       elements, individually;

          a control unit that controls the plurality of switching elements in response to an external clock signal to simultaneously output the image signals from the predetermined number of photoelectric conversion elements in  
20       one of the plural groups; and

          signal output lines with a number equal to N, wherein the predetermined number of photoelectric conversion elements in each of the plural groups are connectable with the respective ones of the signal output lines through the  
25       switching elements, individually, to output the image

signals from the predetermined number of photoelectric conversion elements to the signal output lines;

5 a sample-and-hold circuit connected to the signal output lines of the image sensor for temporarily storing the image signals transferred from the photoelectric conversion elements in one group through the corresponding ones of the switching elements and the signal output lines;

a multiplexer for multiplexing the image signal stored temporarily in the sample-and-hold circuit; and

10 an analog-to-digital converter for converting the image signal that is multiplexed by the multiplexer into a digital signal.

14. The image reading apparatus according to claim 13, wherein each of the signal output lines is provided with  
15 an analog amplifier for amplifying the image signal transferred from the corresponding one of the photoelectric conversion elements through the corresponding one of the switching elements.

15. An image reading apparatus comprising:  
20 an image sensor that includes:

a plurality of photoelectric conversion elements arranged in a main scanning direction, each of the plurality of photoelectric conversion elements generating an analog image signal corresponding to an amount of incident light  
25 thereon, the plurality of photoelectric conversion elements

being divided into plural groups, each of the plural groups including a predetermined number (N) of the photoelectric conversion elements;

5 a plurality of switching elements connected to respective ones of the plurality of photoelectric conversion elements, individually;

a control unit that controls the plurality of switching elements in response to an external clock signal to simultaneously output the image signals from the predetermined number of photoelectric conversion elements in  
10 one of the plural groups; and

signal output lines with a number of N, wherein the predetermined number of photoelectric conversion elements in each of the plural groups are connectable with the  
15 respective ones of the signal output lines through the switching elements, individually, to output the image signals from the predetermined number of photoelectric conversion elements to the signal output lines;

a multiplexer connected to the image sensor for  
20 multiplexing the image signal transferred from one of the photoelectric conversion elements through the corresponding one of the output signal lines; and

a sample-and-hold circuit connected to the image sensor for temporarily storing the image signals transferred  
25 from the photoelectric conversion elements in one group



though the corresponding ones of the switching elements and the signal output lines; wherein the multiplexer is configured to connect with the image sensor so that one output signal line connects the image sensor to the multiplexer directly and the other output signal lines connect the image sensor to the multiplexer through the sample-and-hold circuit.

16. An image reading apparatus comprising:

an image sensor that includes:

10 a plurality of photoelectric conversion elements arranged in a main scanning direction, each of the plurality of photoelectric conversion elements generating an analog image signal corresponding to an amount of incident light thereon, the plurality of photoelectric conversion elements being divided into plural groups, each of the plural groups including a predetermined number (N) of the photoelectric conversion elements,

15 a plurality of switching elements connected to respective ones of the plurality of photoelectric conversion elements, individually;

20 a control unit that controls the plurality of switching elements in response to an external clock signal to simultaneously output the image signals from the predetermined number of photoelectric conversion elements in one of the plural groups; and

25

signal output lines with a number equal to N,  
wherein the predetermined number of photoelectric conversion  
elements in each of the plural groups are connectable with  
the respective ones of the signal output lines through the  
5 switching elements, individually, to output the image  
signals from the predetermined number of photoelectric  
conversion elements to the signal output lines;

an analog front-end IC that includes;

an analog amplifier for amplifying an analog  
10 input signal received through one of a plurality of  
channels;

a multiplexer for multiplexing the analog input  
signal amplified by the analog amplifier; and

an analog-to-digital converter for converting the  
15 analog input signal of each channel that is multiplexed by  
the multiplexer into a digital signal;

wherein the signal output lines function as the  
plurality of channels of the analog front-end IC, and the  
analog front-end IC is connected to the image sensor so that  
20 the analog front-end IC receives the image signal  
transferred from each of the photoelectric conversion  
elements through the corresponding one of the signal output  
lines as the analog input signal.

17. The image reading apparatus according to claim  
25 16, wherein each of the signal output lines is provided with

an analog amplifier for amplifying the image signal transferred from each of the photoelectric conversion elements through the corresponding one of the switching elements.

5           18. An image reading apparatus comprising:

an image sensor that includes:

a plurality of photoelectric conversion elements arranged in a main scanning direction, each of the plurality of photoelectric conversion elements generating an analog  
10 image signal corresponding to an amount of incident light thereon, the plurality of photoelectric conversion elements being divided into plural groups, each of the plural groups including a predetermined number (N) of the photoelectric conversion elements;

15           a plurality of switching elements connected to respective ones of the plurality of photoelectric conversion elements, individually; and

a control unit that controls the plurality of switching elements in response to an external clock signal  
20 to simultaneously output the image signals from the predetermined number of photoelectric conversion elements in one of the plural groups, wherein the predetermined number of photoelectric conversion elements in each of the plural groups are connectable with the respective ones of the  
25 signal output lines through the switching elements,

individually, to output the image signals from the predetermined number of photoelectric conversion elements to the signal output lines;

5 a multiplexer having signal input terminals with a number equal to N and a signal output terminal, the multiplexer being connected to the image sensor so that the multiplexer receives the image signals from the plural photoelectric conversion elements that belong to one of the groups through the signal input terminals simultaneously;

10 an analog-to-digital converter connected to the signal output terminal of the multiplexer for converting the analog image signal supplied sequentially from the multiplexer into a digital signal; and

resolution switching unit that select one of a high resolution mode in which all the image signals from the photoelectric conversion elements that belong to each of the groups are supplied sequentially to the analog-to-digital converter and a low resolution mode in which the image signals are thinned out and then supplied to the analog-to-digital converter.

19. The image reading apparatus according to claim 18, wherein the resolution switching unit is configured to supply the image signals received from only one of the signal input terminals to the analog-to-digital converter, when the low resolution mode is selected.

20. The image reading apparatus according to claim 18, wherein the resolution switching unit is configured to select the signal input terminals among all the signal input terminals to supply the image signal from the selected signal input terminals to the analog-to-digital converter by switching the selected signal input terminals time-sequentially when the low resolution mode is selected.

21. The image reading apparatus according to claim 18, further comprising an averaging circuit for averaging the image signals selected among the image signals received from the plural photoelectric conversion elements that belong to one of the groups, wherein

the resolution switching unit selects another low resolution mode in which the averaging circuit is used to lower the resolution of the image in addition to the high and low resolution modes, wherein

an output signal of the averaging circuit is supplied to the analog-to-digital converter when the another low resolution mode is selected.

22. The image reading apparatus according to claim 21, wherein the averaging circuit is configured to average all the signals received from the photoelectric conversion elements that belong to one of the groups and to supply the averaged signal to the analog-to-digital converter.

24. The image reading apparatus according to claim

22, wherein the averaging circuit is configured to average all the signals received from the photoelectric conversion elements that belong to one of the groups and to supply the averaged signal to the analog-to-digital converter.